

CLAIMS

What is claimed is:

1. A method for performing photoacoustic spectroscopy (PAS) of a sample, the method comprising:
 - (a) providing a light source configured to introduce light having at least one wavelength into the sample such that at least one molecule within the sample is stimulated, generating an acoustic signal;
 - (b) accumulating the acoustic signal in a resonant acoustic detector; and
 - (c) displaying an output signal indicative of the acoustic signal.
2. The method according to claim 1 wherein the wavelength of the light in step (a) is selected such that the molecule resonates at the wavelength.
3. The method according to claim 1 wherein the light provided in step (a) is modulated at a resonant acoustic frequency f .
4. The method according to claim 3 wherein the acoustic detector resonates at the resonant acoustic frequency f .
5. The method according to claim 4 wherein the acoustic detector accumulates the acoustic signals during a predetermined number of oscillation periods Q .
6. The method according to claim 5 wherein Q and f are related by the equation $t = Q/f$, with t being the time it takes the acoustic detector to accumulate one acoustic signal.
7. The method according to claim 6 wherein Q is less than 8,000.
8. The method according to claim 1, further including the steps of converting said acoustic signal to an electric signal and amplifying at least one of the signals, prior to step (c).
9. The method according to claim 1 wherein the light source is a laser.
10. The method according to claim 1 wherein the acoustic detector comprises a low-loss crystal material shaped into a resonant element.
11. The method according to claim 9 wherein the material is piezoelectric quartz.
12. The method according to claim 10 wherein the quartz resonant element is a tuning fork.
13. A photoacoustic spectroscopy (PAS) system for detecting an acoustic signal, the system comprising an acoustic detector, wherein the acoustic detector accumulates at least one resonant acoustic signal and emits an electrical signal corresponding to the acoustic signal.
14. The system according to claim 13 further comprising a preamplifier connected to the acoustic detector, wherein the preamplifier amplifies at least one of the signals.
15. An acoustic detector comprising a piezoelectric material, the piezoelectric material configured to accumulate acoustic signals.